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**ORGANIZATION
and
ADMINISTRATION
of
AGRICULTURAL RESEARCH
in the
UNITED STATES**

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By Dr. Nyle C. Brady, Director of Science and Education
U.S. DEPARTMENT OF AGRICULTURE, WASHINGTON, D.C.

Talk by Dr. Nyle C. Brady
Director of Science and Education
U. S. Department of Agriculture
before OECD Committee for Agriculture
Paris, France
October 19, 1964

PRINCIPLES OF AGRICULTURAL RESEARCH MANAGEMENT IN THE UNITED STATES

The rate of accumulation of knowledge through scientific activity this century has been without parallel in human history.

This restless urge to discover the ". . . deeply hidden something that has to be behind all things," as Einstein has said, is generally recognized as the force underlying all progress.

In my own country, we have rapidly developed and implemented scientific knowledge and technology as a matter of national policy. Agriculture in particular has been uniquely successful in utilizing science to attack and solve many of the age-old basic problems of life, and help our people to achieve a more meaningful, more hopeful existence.

Although research has always been important in developing our agricultural technology, since early this century it has been assuming an increasingly critical role. There is no question that it will be the key factor in any future progress.

Publicly supported agricultural research in the United States had its major beginnings in 1862, following enactment of two Federal laws creating the Department of Agriculture and the land-grant colleges. Legislation in 1887 made Federal funds available to the States on a continuing basis, to establish and operate agricultural experiment stations as part of the land-grant colleges. In 1914, legislation was enacted by the Congress to set up a cooperative Federal-State agricultural extension service to bring new research ideas and techniques to people on the farms, where they could be put to practical use.

Thus was established the legislative framework for our Federal-State system of agricultural research.

Through the years, it has developed to meet both local and national needs, due largely to the great variations in the climate and physical conditions of our Nation . . . and our long-standing belief in the rights of the individual States.

In the broad sense, agricultural research in the United States includes more than the research of publicly-supported agencies -- that is, the State experiment stations and the U. S. Department of Agriculture. It also includes the increasing amount of research that is being conducted by farmer organizations, by private foundations, and by many food and farm-related industries. These groups have made and are continuing to make important contributions to the richness and diversity of our agricultural enterprises.

I would like now to show you some slides that illustrate this nationwide structure for agricultural research and how it functions . . . and the techniques developed to administer research to make it responsive to the needs of over 190 million American people.

In order to understand the overall structure, we will begin with the Federal organization for science in the United States.

CHART 1

The organizations you see here have been created only recently in the Executive Branch of our Government, to cope with the numerous and increasingly sophisticated problems in science communication, management, long-range planning, policy making, and allocation of resources and personnel. Each has well-defined responsibilities in advancing the Nation's extremely diverse scientific activities.

The Office of Science and Technology is a permanent staff unit which assists the President in developing policies and evaluating programs to make sure that science and technology are being used most effectively to promote the Nation's welfare and security.

The President's Science Advisory Committee is composed of outstanding scientists from universities, industry, and private organizations to advise him on the role of the Federal Government in furthering science. It undertakes special studies designated by the President and initiates many of its own, some in the field of agriculture.

The Federal Council of Science and Technology, composed of representatives of the eight Government agencies conducting research, is concerned with more effective planning and administration of Federal scientific and technological programs. The Council's membership includes the Departments of Defense; Health, Education, and Welfare; Interior; Commerce; and Agriculture; and the National Science Foundation, Atomic Energy Commission, and the National Aeronautics and Space Administration.

The United States Government is spending about \$15 billion this year to support the research activities of these agencies.

CHART 2

Less than $1\frac{1}{2}$ percent of the \$15 billion Federal research budget is expended for agricultural research. This is a substantial drop in percentage from 1940, when agriculture received some 40 percent of the \$74.1 million the Federal Government was spending for research.

Let us consider agricultural research in terms of budgets.

CHART 1

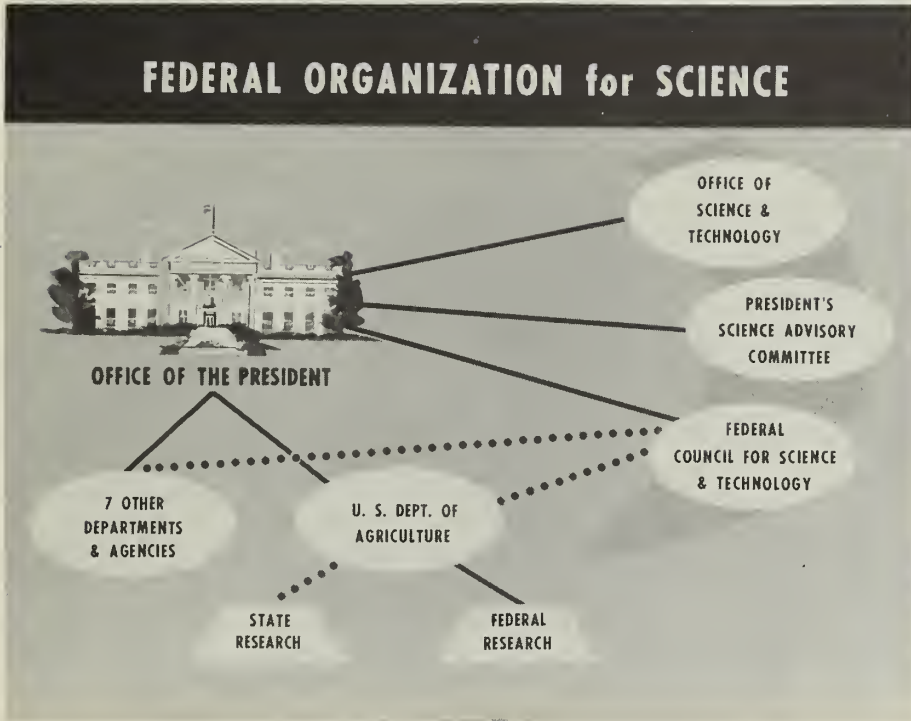
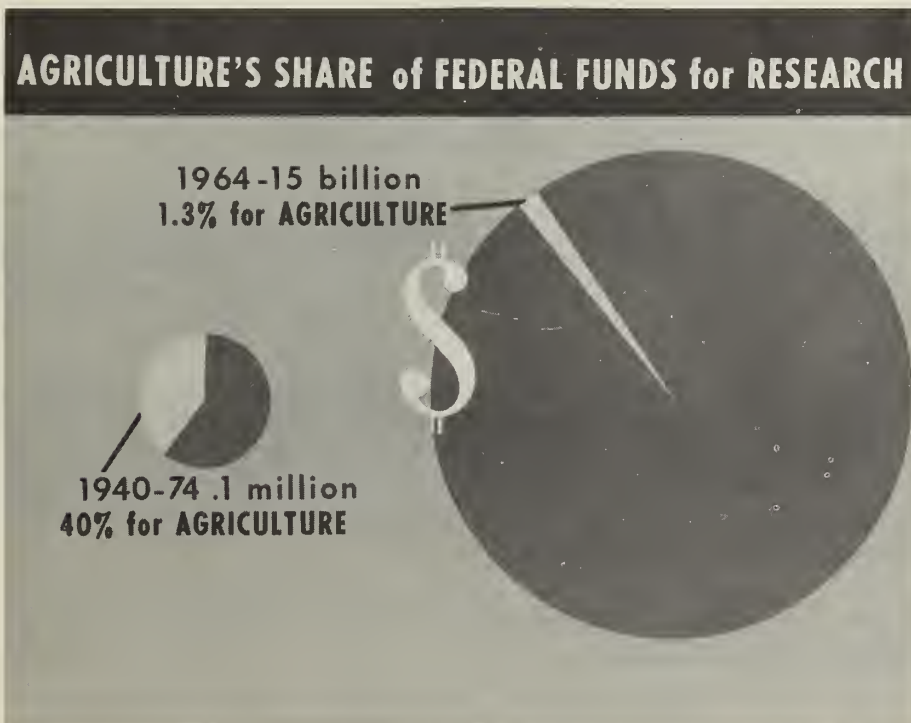


CHART 2



AGRICULTURAL RESEARCH in the U.S.

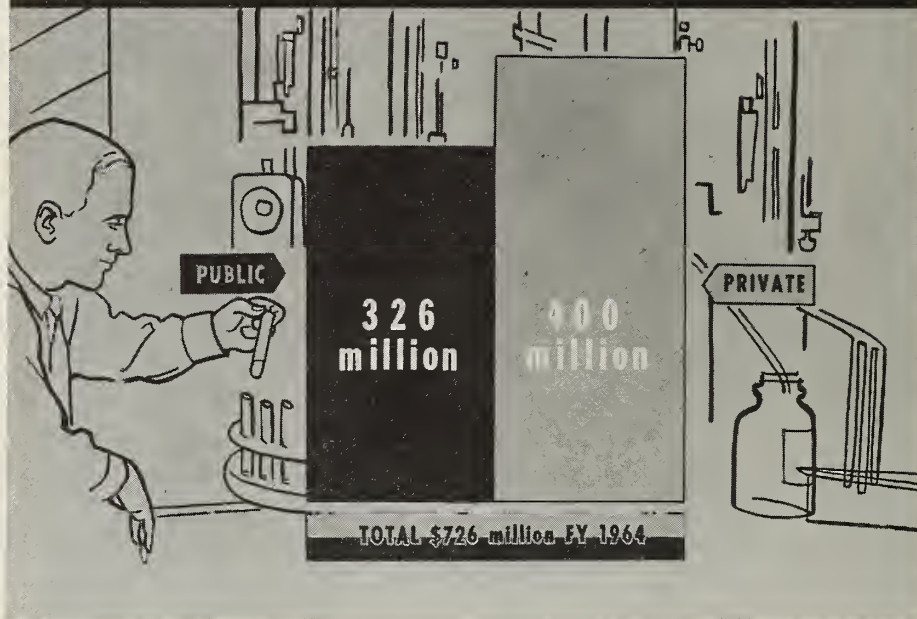


CHART 3

As I have indicated, agricultural research in the United States is a joint effort of public and private agencies.

The public partners -- that is, the Department of Agriculture and the State agricultural experiment stations -- are spending approximately \$326 million. This includes \$10 million transferred to the Department this year from other Department agencies for specific work.

Our best estimate of what private industry spends for agricultural research is approximately \$400 million. Industry has become a major force in agricultural research in the last few decades -- because of the machinery, chemicals, and biologicals that industry supplies to agriculture, and because of the raw materials that agriculture provides to industry.

Total funds for agricultural research in our country amount to approximately \$726 million.

PUBLIC FUNDS for AGRICULTURAL RESEARCH

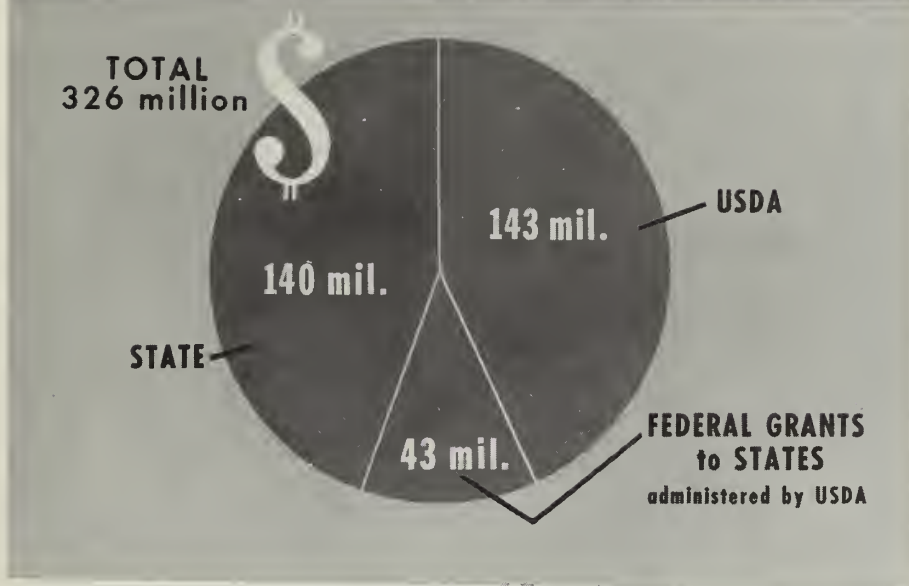


CHART 4

Now, let's examine the public funds for agricultural research a little more closely.

The \$140 million that the States provide includes \$7 million that is made available to them by industry for agricultural research.

The Federal Government provides \$143 million for the Department of Agriculture and \$43 million for Federal grants to the States. Part of these Federal-grant funds, by the way, are distributed equally to each State, and the rest in accordance with a formula based on the State's rural and farm population. Incidentally, these figures represent the operating budget and do not include funds for facilities.

SOURCE OF FUNDS

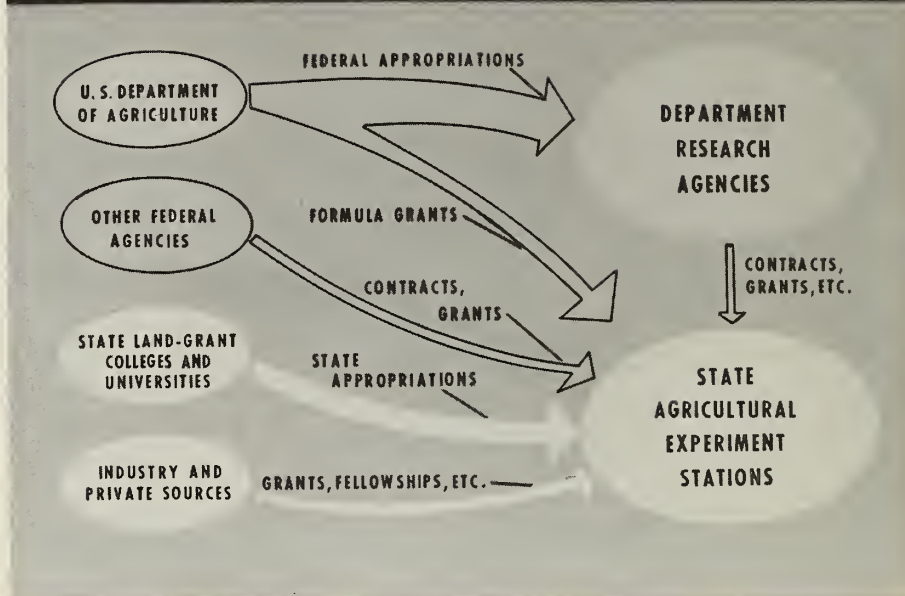


CHART 5

Here you see the source of all of the funds that are spent for agricultural research by the State experiment stations and research agencies in the Department. The width of the arrows indicates the amount of funds distributed; the color, where the money comes from.

You will note that the Federal appropriations allocated to the Department of Agriculture comprise the major source of money for agricultural research, with Federal grants to the States an important part of these appropriations. As you can see, State appropriations going to the State experiment stations at the land-grant colleges are the second largest source of funds for agricultural research.

Money also comes from Federal agencies other than the Department of Agriculture through contracts and grants; from industry and private sources through grants and fellowships; and from various research agencies of the Department of Agriculture through contracts, cooperative agreements, and grants.

STATE EXPERIMENT STATION FUNDS

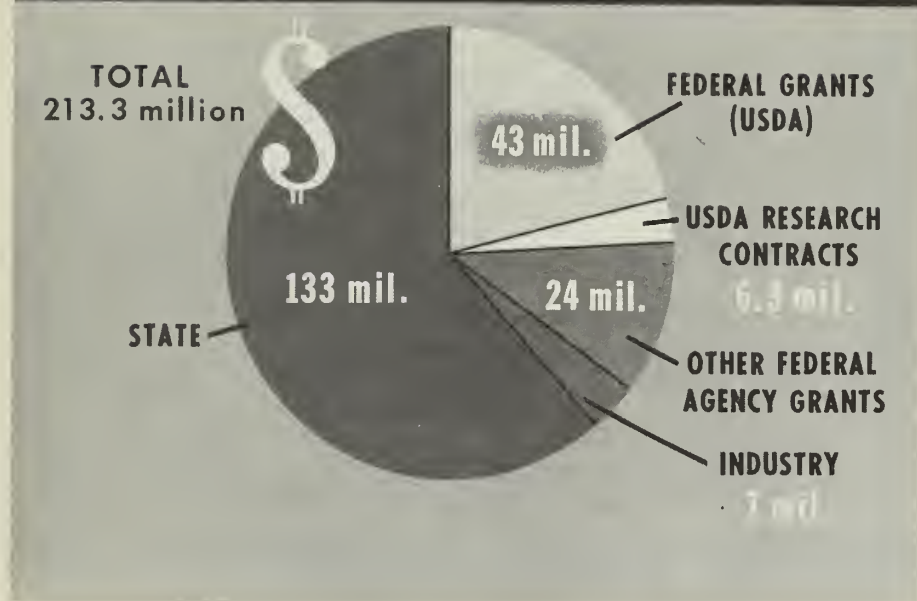


CHART 6

Here you see what these sources actually contribute to the research budget of the State experiment stations, which this year totals \$213.3 million.

Approximately \$133 million of this amount is actually provided by the States, although the \$7 million from industry, as I have indicated, is generally considered as part of State funds. The Federal grants that the Department administers, along with the Department research contracts, amount to approximately one-fourth of the funds available to the States.

USDA RESEARCH FUNDS

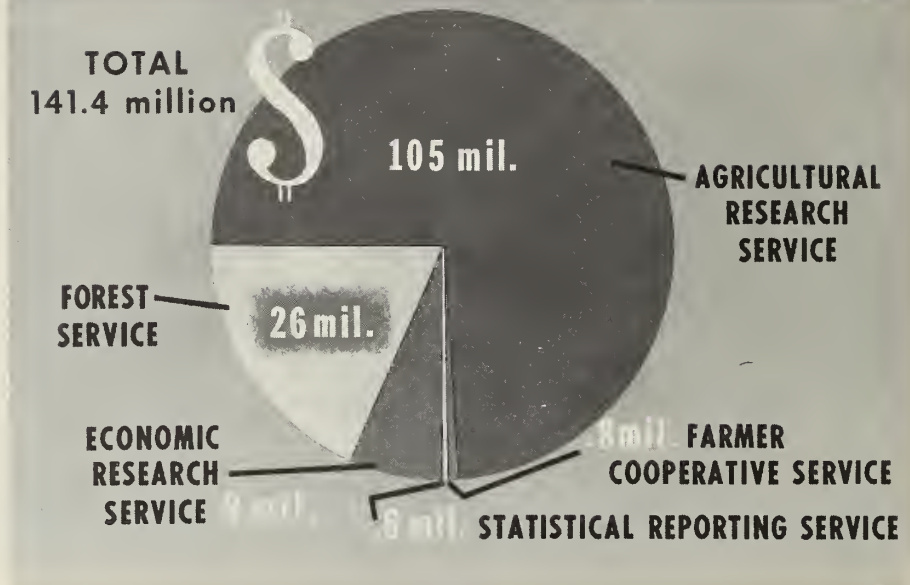


CHART 7

Here you see the same breakdown of funds for the five agencies in the Department of Agriculture that conduct research. These include the Agricultural Research Service, Forest Service, Economic Research Service, Farmer Cooperative Service, and the Statistical Reporting Service.

You will note that the Agricultural Research Service accounts for approximately three-quarters of the Department's total research effort.

When the total of \$141.4 million is added to the \$1.6 million allocated to the National Agricultural Library and listed as research, we come up with the figure of \$143 million, the current operating budget for agricultural research in the Department of Agriculture.

So far, I have talked mainly about agricultural research in terms of budgets. Now, I want to take some time to talk about how we plan, manage, and coordinate research . . . and the organization through which research operates.

USDA ORGANIZATION FOR SCIENCE

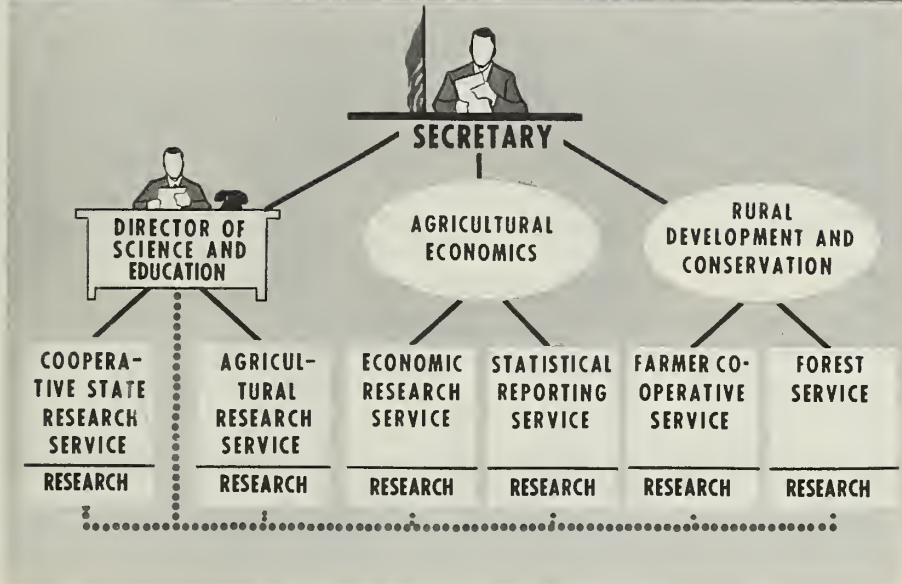


CHART 8

Here is the Department's basic organization for science.

In addition to the five agencies I have already listed, there is also the Cooperative State Research Service. This is the agency within the Department that administers the Federal-grant funds to the State experiment stations. The Federal-grant funds support about a fourth of the research of the State experiment stations, with the States, industry, and foundations providing the rest.

You will notice that the Director of Science and Education is directly responsible for only the Agricultural Research Service and the Cooperative State Research Service. Research in the other four agencies supports the highly specific objectives of those agencies. It is, however, fully coordinated through the Director's office.

It is because of these extensive relationships among Department research agencies that major problems in coordination arise.

COORDINATION WITHIN USDA

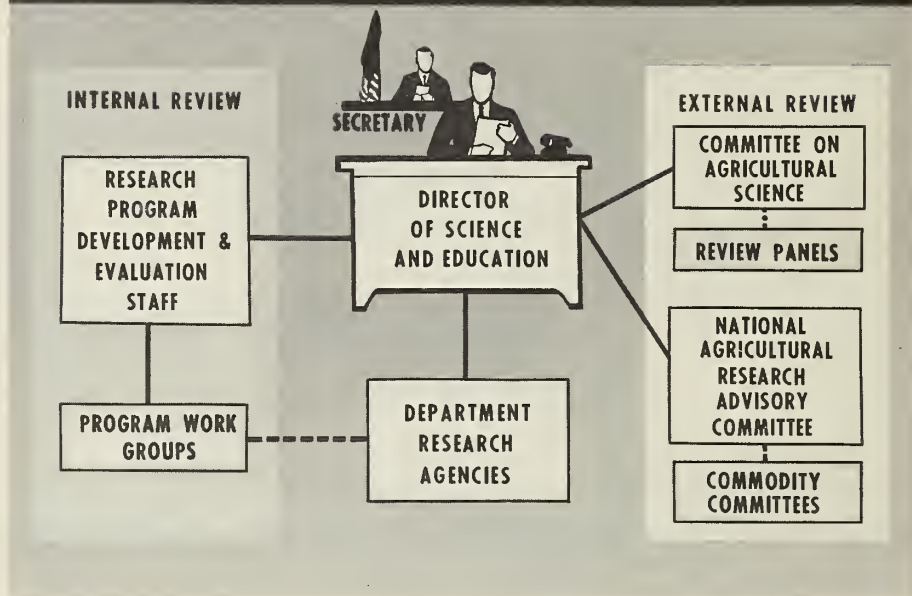


CHART 9

In coordinating research in the Department of Agriculture, we have the help of the administrators of the various research agencies and the assistance of various committees and groups, both in and outside the Government. Each of these committees and groups has responsibilities for bringing order and direction into a large and complex research establishment. They help us to determine if we are doing a good job . . . and if we are making adequate plans for the future.

To begin with, internal review is carried out through the newly formed Research Program Development and Evaluation Staff. This organization has major responsibilities for assisting in the overall development of the Department's research programs. It will be coordinating research activities among Department agencies and with State, private, and other research organizations . . . and it will be carrying on a continuing evaluation of research to determine if goals and needs are being met.

The new staff will have the assistance of various program work groups to conduct whatever detailed, specialized studies are necessary to carry out its responsibilities.

External review and advice for carrying out the Department research programs come from several sources. One is the Committee on Agricultural Science, composed of 15 of the Nation's outstanding scientists. This Committee conducts a continuing evaluation of the research supported by Federal funds, particularly work of a basic nature, with a view to appraising our capacity for significant research. Review panels assist in planning and maintaining cooperation between agencies of the Department and research in closely related fields.

Next, we have the legally required National Agricultural Research Advisory Committee, whose members are concerned with various aspects of agriculture. This committee makes recommendations to insure broad coverage of all important areas in agriculture in the interest of maintaining a comprehensive, dynamic, and flexible research program.

This committee maintains contact with 12 advisory or commodity committees, which review various segments of our current research and recommend adjustments. These unique committees, representing all aspects of agricultural problems, offer an ideal system of communication between the Department and consumers and farmers.

Coordination of research with other Department and Federal agencies is accomplished through Department membership in the Federal Council of Science and Technology . . . and representation on all interdepartmental committees dealing with problems of interest to the Department of Agriculture.

In addition, the Department participates in the Science Information Exchange, which provides first-hand knowledge of all Federal research projects in each field.

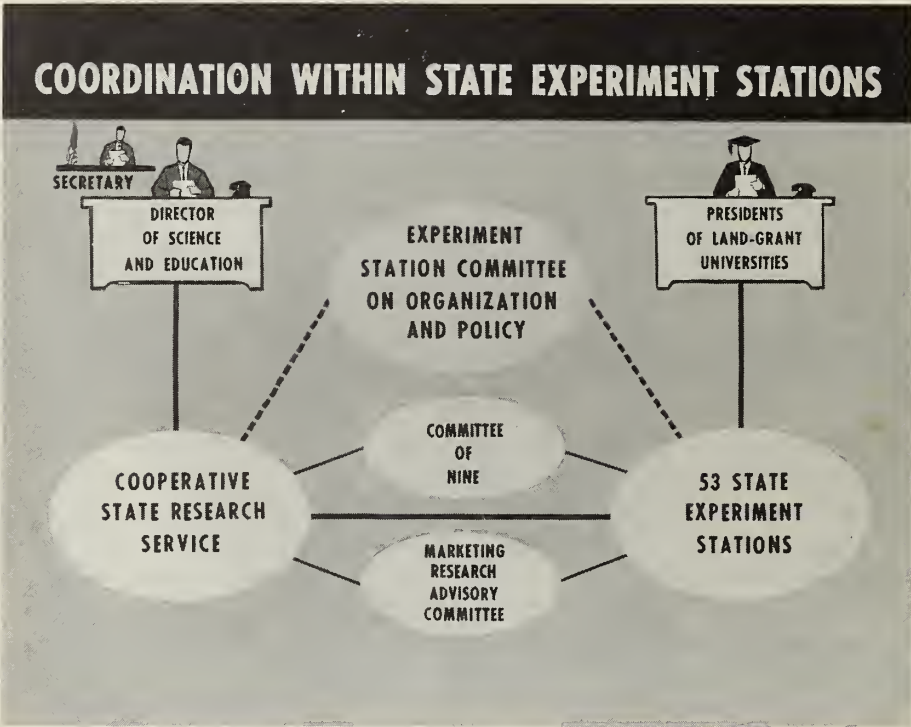


CHART 10

In coordinating research within the State experiment stations, the directors have the assistance of an old and well-established group -- the Experiment Station Committee on Organization and Policy. This Committee of elected Experiment Station Directors participates with the Cooperative State Research Service and the Department of Agriculture in formulating policies on the cooperative research programs of the States and the Department.

The Committee of Nine, which you see here, is chosen by the Directors of the State experiment stations to recommend the regional studies that are supported by funds under the Hatch Act.

The Cooperative State Research Service, which administers the work supported by Federal-grant funds, makes sure that the money is spent as Congress intended. It also gives the State experiment stations technical assistance in the planning and conduct of research.

The Marketing Research Advisory Committee reviews Federal-grant research and recommends any changes that may be needed.

COORDINATION OF FEDERAL-STATE RESEARCH

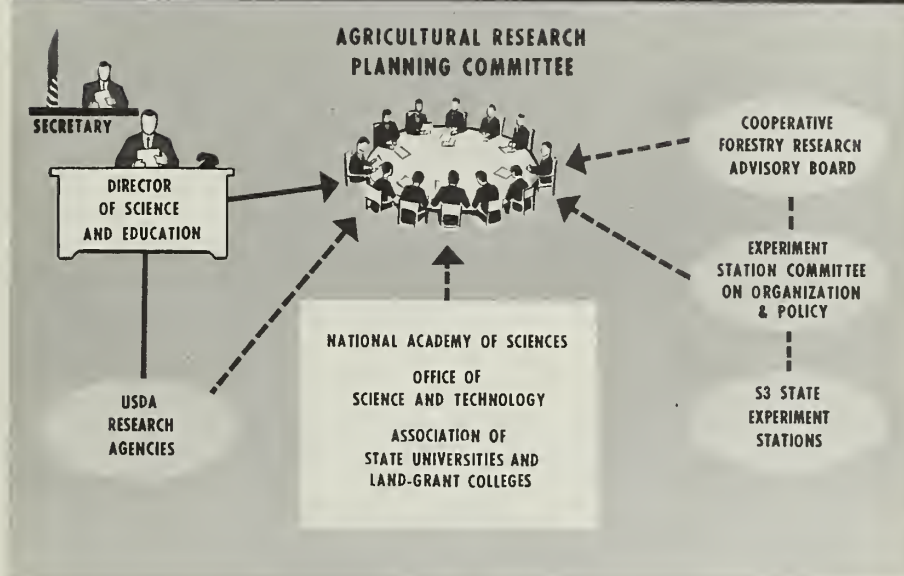


CHART 11

Coordinating Federal-State research is a major task when you consider the parts of the structure -- the land-grant colleges and universities, the State agricultural experiment stations, the several agencies of the U. S. Department of Agriculture, and the several hundred State and Federal stations at different locations throughout the Nation.

The recently established Agricultural Research Planning Committee will provide a strong base for coordinating the research programs of all these agencies. This group will assist in working out long-range national agricultural research plans and goals and in determining the areas of Federal and State responsibility in carrying them out. Other responsibilities include improving Federal and State cooperation in broad regional research, helping coordinate plans for Federal and State research facilities, and stimulating interchange of scientists at all levels.

Membership in this group includes representatives of Department research agencies; Station directors selected by the Experiment Station Committee on Organization and Policy; a president of a land-grant university, selected by the Association of State

Universities and Land-Grant Colleges; and representatives from the National Academy of Sciences, and the Office of Science and Technology.

The Cooperative Forestry Research Advisory Board, made up of representatives of State, Federal, and private agencies, gives advice in carrying out a nationwide program of cooperative forestry research, which was recently authorized under the McIntire-Stennis Act.

These broad review and coordinating services help the experiment stations and the Department to avoid research duplication, to recognize where work needs to be done, and to plan and carry out a more effective Federal-State program of agricultural research.

CHART 12

Research is coordinated in other ways as well. For one thing, the States and the Department each have definite research responsibilities. Each State is responsible for work of interest to its people. The Department is responsible for work of national or regional significance, generally in cooperation with one or more States. In cooperative work of mutual interest, State and Federal people decide jointly what portion each will undertake. To help us make these decisions, we utilize committees of State and Federal specialists in the major areas of research.

There is continuous close association between the 2,300 Department people working in the land-grant colleges and experiment stations, and the State people who work in these places. Frequently, Department scientists teach courses on a part-time basis in their fields of study. Faculty members of the land-grant colleges may undertake special research projects for the State experiment station or the Department of Agriculture.

CHART 13

Coordination is achieved in still another way -- through maintaining and using up-to-date inventories of all current research projects. This research project system, which we are in the process of modernizing, helps us in examining and analyzing all current and proposed Federal and State research.

Currently, the Department of Agriculture maintains detailed records of some 3,700 Department research projects. The Cooperative State Research Service maintains similar records on approximately 6,700 State-supported projects, and 6,400 projects financed all or in part by Federal funds. Both sets of records provide the background information on current work against which all proposed new projects

CHART 12

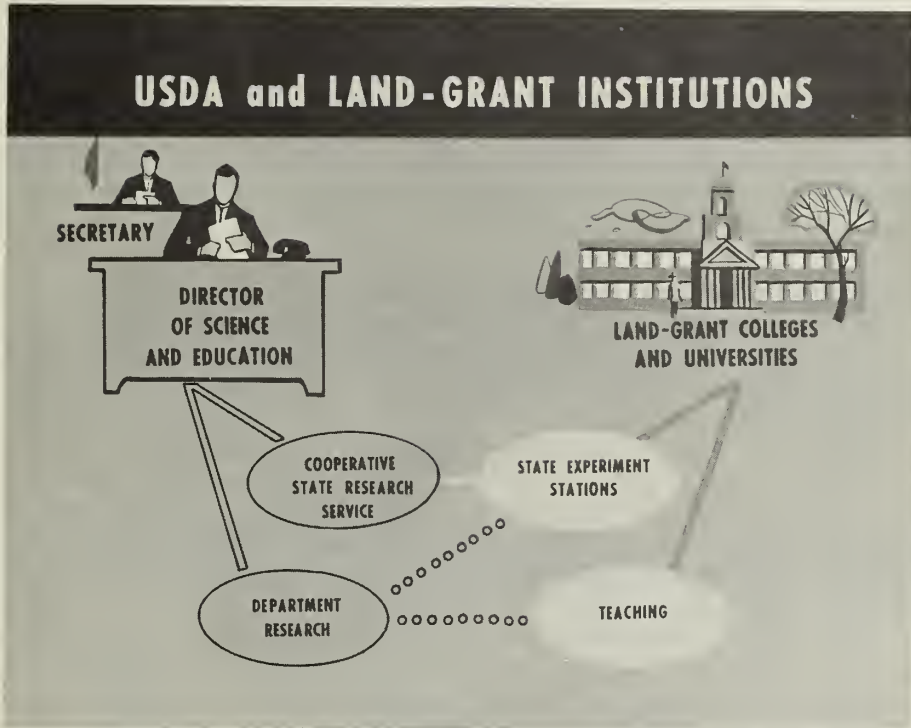


CHART 13



to be supported by Federal funds are examined. This is the key to effective coordination and prevention of unnecessary duplication.

According to current plans, we expect to have the records of the State-supported projects, Department projects, and Federal-grant projects fully automated, and located in one place. This will involve extensive voluntary cooperation on the part of the experiment stations in providing information on State-supported projects, over which the Department exercises no control.

The improved system for maintaining research project records will provide a source of communication between scientists on all aspects of current research programs. And it will provide comprehensive information to permit ready analysis of research for more effective management.

From what I have said and the slides I have shown, I hope that you understand the scope of our nationwide organization for agricultural research . . . and the procedures through which research is planned and resources are committed.

To summarize -- before I move on to my next point -- publicly supported agricultural research in the United States is carried on jointly by the Department of Agriculture and the autonomous State land-grant universities, each with its college of agriculture and experiment station. Farm and industry organizations and other groups assist in planning the research, and cooperate and coordinate in carrying it out.

The methods for planning and managing agricultural research involve a high degree of voluntary cooperation between the States and various agencies of the Department of Agriculture. The management procedures include continuous review from many different points of view to insure that research is meeting all the important problems of the time.

Although our public agricultural research involves Federal and State action and wide dispersal of activities, the important thing to remember is that it is essentially a cooperative program directed to a single national purpose -- the most efficient production, processing, marketing, and distribution of our farm products. And it takes into account the varying conditions and needs of the individual States.

These, then, are some of the principles of research management. But what about the day-to-day operation -- the working organization through which authority is delegated and control is achieved?

Federal and State agricultural research is broken down into approximately 16,800 projects in a dozen or so subject-matter

fields. The problems, objectives, and plan of work are clearly defined for each project. Projects are assigned to scientists located in the first main organizational structure, which, in the Department of Agriculture, is the branch. This, in turn, is part of a larger organizational structure, the division, which may include as many as ten branches. The division chief is responsible to the administrator of his research service. And the research administrators answer to the Director of Science and Education, who is answerable to the Secretary of Agriculture.

Similarly, in a State experiment station, the project leader is a staff member in a subject-matter department. The department head is responsible to the director of the experiment station. He, in turn, is responsible to the president of the institution, either directly or through a dean of agriculture. Funds, personnel, and all other research resources are managed and controlled through these organizations.

So far, I have talked mainly about financing and coordinating research. Now, I want to take a moment to talk about the techniques for keeping up with the new problems created by changing conditions. Where do the ideas and the proposals for research come from?

CHART 14

In most cases, scientists in the Department of Agriculture or the State experiment stations recognize and define problem areas and develop research approaches to solve them. Scientists outside the Department and the Federal Government also contribute to the flow of research ideas.

In some cases, farmers themselves recognize a new disease or a problem that needs research attention. Farm organizations and publications, and local civic groups, may point the need for new work. Frequently, Extension Service agents, through their day-to-day contact with farmers, recognize special problems.

There is a constant screening and sifting of ideas and proposals, and many more are suggested than we can possibly handle.

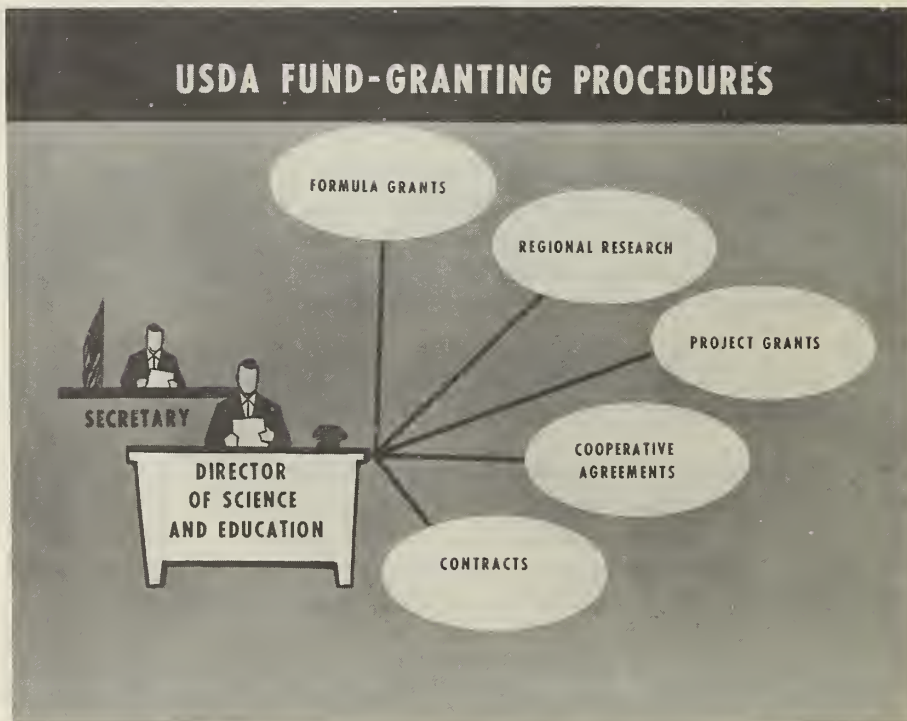
There are the inevitable pressures to perform work of special interest to a particular group. Sometimes, when it is to our advantage also to do the work, we will go along. But, if it is a matter of science versus political consideration, science is given our support, as it must be in order to survive.

It is no easy matter to decide where to put the research money among different fields, and more difficult still to balance our total resources in general areas of research. Ultimately, we are

CHART 14



CHART 15



guided by public need and public opinion in recommending the overall balance of our research effort.

Now, knowing where research proposals come from, let's look at the channels through which research funds are allocated.

CHART 15

As you can see, there are several ways to get work done.

The so-called formula or institutional grant -- which is the most widely used -- assures a broad geographic distribution of research support, and the continuity of funds permits long-range planning. The institution receiving the money largely determines the nature and extent of the work to be done.

The highly competitive project grants are awarded primarily to individual scientists on the basis of their competence, rather than the institutions they represent. Research under this method is largely basic and controlled by the scientists themselves.

Regional research is a cooperative Federal-State venture involving investigations on problems of mutual interest to several States, as provided for in the law authorizing Federal-grant funds. Several State experiment stations and one or more Federal agencies may be involved in the joint planning and conduct of regional research. About 25 percent of the Federal research funds available to the States is devoted to work of this kind.

Contracts are given for specific research, for a stated period of time. The research is usually done to meet a particular need.

Cooperative agreements are arrangements made between the Department research divisions with public or private research agencies to conduct research of mutual benefit to both.

The Department's Agricultural Research Service maintains a contingency fund which is used for research when a serious and unexpected agricultural problem arises.

If this brief description of our fund-granting procedures gives the impression that our research is largely applied and oriented to specific problems, I wish to emphasize that we are very conscious of the importance of basic research. Fully a third to a half of our total research effort can be characterized as basic, and the figure has been increasing for some time.

Regardless of what work we choose to do, however, or how we choose to do it, research will proceed only as there are competent scientists to do the work.

IMPROVING SCIENTISTS' ADVANCEMENT

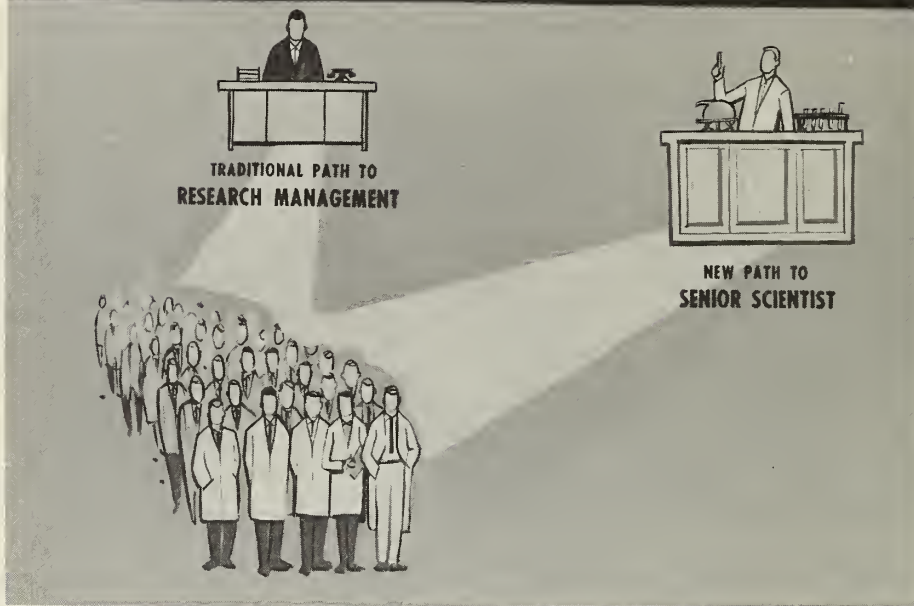


CHART 16

In a recent move to increase the effectiveness of our staff, the Department of Agriculture instituted a policy of advancing able young scientists on the basis of their growth as scientists, instead of making them go through the traditional path of research management. Thus, those scientists who wish to stay in research have the opportunity to progress just as rapidly as those who choose to go into research management.

On the whole, we have encouraged our people to take every available opportunity for additional training and coursework and to study for advanced degrees. We have used our limited legislative authority to pay the necessary expenses for much of this schooling.

Just recently, however, we completed a comprehensive study which pointed up how much more could be done to make sure that scientists keep current with changes in their disciplines . . . and to give them the necessary environment to permit individual and scientific growth.

The study recommended that we intensify our efforts to give scientists the training and retraining they need to increase their effectiveness . . . and that we establish a comprehensive leave program for this purpose. Technical support personnel also must be given training opportunities to develop their full potential.

The study stressed the importance of an intellectual and scientific environment. It suggested closer cooperative relations with colleges and universities, and recommended that all new research facilities be located on or near a university campus.

Members of the study group also recommended that the Department obtain legislative authority to sponsor undergraduate, graduate, and postdoctoral scholarships, as well as fellowships and assistantships. And it recommended that we work with colleges and universities in developing courses of study to meet future needs for scientists. Particular emphasis is placed on additional study for scientists who have been out of classrooms for five or more years. For, as our experts tell us, much of what university graduates learn today is obsolete in as little as ten years' time. And further, much of what they will have to know is not even available today.

We plan to implement as many of these recommendations as we can. We feel a strong obligation to make the fullest use of our trained people . . . and to provide them with the retraining necessary to keep pace with the rapidly advancing scientific frontiers.

In broad outline, then, these are the ways that our nationwide structure for agricultural research operates. It is an extraordinarily effective structure -- one that is uniquely American in its inception and growth, although it certainly was not planned with any grand design for the future in mind.

It is, I suppose, an outgrowth of attitudes more than talent, for bright people are found everywhere. It comes from a national conviction that if a group of people work hard enough and long enough to solve a problem, then it gets solved. And it stems, too, from a basic regard for the values of human life and good standards of living.

If, as someone has said, culture is wine and cheese, and civilization is bathrooms and plumbing, I say it is the task of agriculture to provide the kind of abundant economy that will make both possible.

